

## **Protecting Worker Health and Safety Using Remote Handling Systems**

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Lawrence Livermore National Laboratory (LLNL) is currently developing and installing two large scale, remotely controlled systems for use in protecting the environment and improving worker health and safety by minimizing exposure to hazardous and mixed wastes. The first system is a semi-automated reagent feed system for use at LLNL's existing aqueous low-level radioactive and mixed waste treatment facility (Tank Farm). The Tank Farm facility is used to remove radioactive and toxic materials in aqueous low-level and/or mixed wastes prior to discharge to the City of Livermore Water Reclamation Plant in accordance with established discharge limits. The purpose of installing this reagent feed system is to improve operational safety and process efficiency by eliminating the need for manual handling of reagents used in the treatment processes. This was done by designing, fabricating, and installing a semi-automated delivery system which can be controlled both remotely and locally via a Programmable Logic Controller. Precisely metered amounts of various reagents ( $\text{NaOH}$ ,  $\text{H}_2\text{SO}_4$ ,  $\text{Fe}_2(\text{SO}_4)_3$  and  $\text{H}_2\text{O}_2$ ) can be injected into the treatment tanks to perform neutralization, oxidation, pH control, chelation/flocculation, adsorption and other chemical processes on the wastes.

The second system uses a robotic system for handling, characterizing, processing, sorting, and repackaging hazardous wastes containing tritium. This system combines an IBM developed gantry robot mounted within a special glove box enclosure designed to protect the operators and minimize the potential release of tritium to the atmosphere. Tritiated waste handling will be performed remotely using the robot in a telerobotic mode for one-of-a-kind functions and in an autonomous mode for repetitive type operations. The system will initially be used in conjunction with a portable gas cleanup unit designed to capture any gas phase tritium inadvertently released into the glove box during waste handling. This paper will present the purpose of these remotely operated systems, provide background related to LLNL's low-level/mixed waste treatment processes, describe the major system components, outline system operations, and discuss current status and plans.